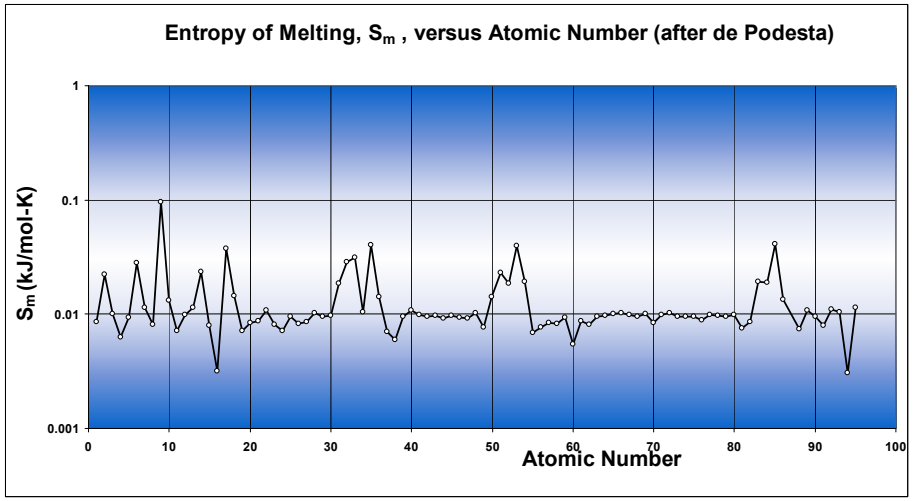
Interstitialcy Theory of Liquids and Glasses

A. V. Granato, University of Illinois, NSF DMR-0138488

- Richard's Rule, which suggests that the entropy of melting has a universal and large value of about 0.01 kJ/mol°K, is fairly well satisfied for most elements (see Figure). The deviations from this constant value are systematic for columns of the periodic table in most cases.
- The magnitude of this basic property, known since 1893, has never been explained. It has proved to be a stumbling block for previous theories, requiring more entropy than can be predicted.
- However, it follows directly from the low frequency resonance modes of interstitials in a dumb bell configuration.
- As a result, the Interstitialcy Theory of Condensed Matter provides a quantitative understanding of this universal and characteristic phenomenon of melting.



Interstitialcies can explain the entropy of melting of the elements. In addition, the high concentration of these defects in liquids, super-cooled liquids and glasses accounts for the dramatic changes in their thermal, electrical, and mechanical properties relative to crystalline solids.

Interstitialcy Theory of Liquids and Glasses II

A. Granato, University of Illinois, NSF DMR 01-38488

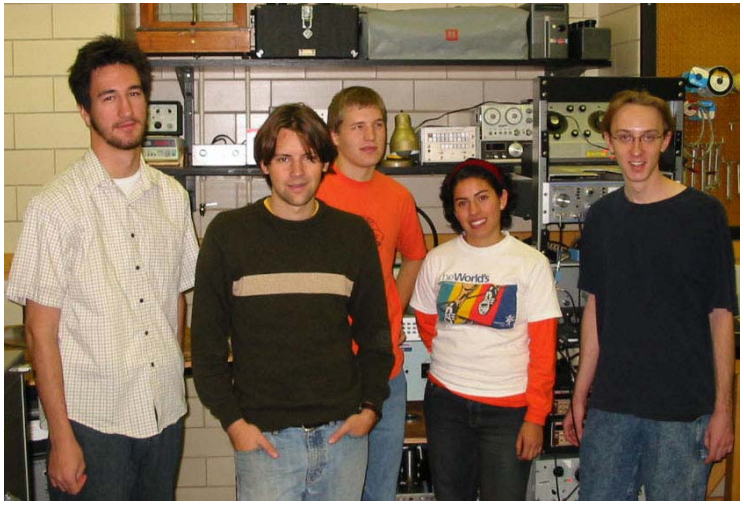
Education:

- Three visiting scholars
  - D. M. Joncich, Ph.D. (full time)
  - V. A. Khonik, Ph.D., D.S. (part time)
  - D. M. Zhu, Ph.D. (part time)
- One graduate student
  - A. S. Bains (kinetics of mechanical relaxation near the glass temperature)
- Five undergraduates
  - Alex Pompe (high-T shear modulus)
  - Michelle Alvarado (high-T electrical conductivity)
  - Anthony Karmis (low-T specific heat)
  - Zachary Hensel (low-T thermal conductivity)
  - Tyronne Lim (data acquisition/control)

Outreach:

Two undergraduate students working to test the Interstitialcy Theory under the direction of others

- Allan Niemerg (interstitialcy visualization)
- Alfredo Sanchez (thin film evaporation)



Alex, Zach, Allan, Michelle, and Anthony